A Review of Feeding Types of Benthic Invertebrates Collected in a Small Cove on the South Shore of Nova Scotia

D.S. Moore, N. Drummond-Davis, and R.J. Miller

Fisheries Research Branch
Department of Fisheries and Oceans
Halifax, Nova Scotia
B3J 2S7

September, 1982

Canadian Manuscript Report of Fisheries and Aquatic Sciences 1673

Canadian Manuscript Report of Fisheries and Aquatic Sciences

These reports contain scientific and technical information that represents an important contribution to existing knowledge but which for some reason may not be appropriate for primary scientific (i.e. *Journal*) publication. They differ from Technical Reports in terms of subject scope and potential audience: Manuscript Reports deal primarily with national or regional problems and distribution is generally restricted to institutions or individuals located in particular regions of Canada. No restriction is placed on subject matter and the series reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries management, technology and development, ocean sciences, and aquatic environments relevant to Canada.

Manuscript Reports may be cited as full publications. The correct citation appears above the abstract of each report. Each report will be abstracted by *Aquatic Sciences and Fisheries Abstracts* and will be indexed annually in the Department's index to scientific and technical publications.

Numbers 1-900 in this series were issued as Manuscript Reports (Biological Series) of the Biological Board of Canada, and subsequent to 1937 when the name of the Board was changed by Act of Parliament, as Manuscript Reports (Biological Series) of the Fisheries Research Board of Canada. Numbers 901-1425 were issued as Manuscript Reports of the Fisheries Research Board of Canada. Numbers 1426-1550 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Manuscript Reports. The current series name was changed with report number 1551.

Details on the availability of Manuscript Reports in hard copy may be obtained from the issuing establishment indicated on the front cover.

Rapport manuscrit canadien des sciences halieutiques et aquatiques

Ces rapports contiennent des renseignements scientifiques et techniques qui constituent une contribution importante aux connaissances actuelles mais qui, pour une raison ou pour une autre, ne semblent pas appropriés pour la publication dans un journal scientifique. Ils se distinguent des Rapports techniques par la portée du sujet et le lecteur visé; en effet, ils s'attachent principalement à des problèmes d'ordre national ou régional et la distribution en est généralement limitée aux organismes et aux personnes de régions particulières du Canada. Il n'y a aucune restriction quant au sujet; de fait, la série reflète la vaste gamme des intérêts et des politiques du Ministère des Pêches et des Océans, notamment gestion des pêches; techniques et développement, sciences océaniques et environnements aquatiques, au Canada.

Les Manuscrits peuvent être considérés comme des publications complètes. Le titre exact paraît au haut du résumé de chaque rapport, qui sera publié dans la revue *Aquatic Sciences and Fisheries Abstracts* et qui figuera dans l'index annuel des publications scientifiques et techniques du Ministère.

Les numéros de 1 à 900 de cette série ont été publiés à titre de manuscrits (Série biologique) de l'Office de biologie du Canada, et après le changement de la désignation de cet organisme par décret du Parlement, en 1937, ont été classés en tant que manuscrits (Série biologique) de l'Office des recherches sur les pêcheries du Canada. Les numéros allant de 901 à 1425 ont été publiés à titre de manuscrits de l'Office des recherches sur les pêcheries du Canada. Les numéros 1426 à 1550 ont été publiés à titre de Rapport manuscrits du Service des pêches et de la mer, Ministère des Pêches et de l'Environnement. Le nom de la série a été changé à partir du rapport numéro 1551.

La page couverture porte le nom de l'établissement auteur où l'on peut se procurer les rapports sous couverture cartonnée.

Canadian Manuscript Report of
Fisheries and Aquatic Sciences 1673

September 1982

A REVIEW OF FEEDING TYPES OF BENTHIC INVERTEBRATES COLLECTED IN A SMALL COVE ON THE SOUTH SHORE OF NOVA SCOTIA

by

D.S. Moore, N. Drummond-Davis, and R.J. Miller

Fisheries Research Branch
Department of Fisheries and Oceans
Halifax, Nova Scotia
B3J 2S7

(c) Minister of Supply and Services Canada 1982

Cat. No. Fs 97-4/1673 ISSN 0706-6473

Correct citation for this publication:

Moore, D.S., N. Drummond-Davis, and R.J. Miller. 1982. A review of feeding types of benthic invertebrates collected in a small cove on the south shore of Nova Scotia. Can. MS Rep. Fish. Aquat. Sci. 1673: vi + 29 p.

TABLE OF CONTENTS

Abstract/Resumé v

Introduction 1

Study area 3

Collection methods 3

Taxonomic groupings 14

Phylum Porifera - sponges 14

Classes Calcarea and Desmospongia 14

Class Scyphozoa 14

Class Anthozoa 14

Phylum Platyhelminthes - flatworms 14

Class Turbellaria 14

Phylum Rhynchocoela - proboscis worms 15

Phylum Nematoda - roundworms 15

Phylum Mollusca 15

Class Polyplacophora - chitons 15

Class Gastropoda 15

Class Bivalvia 18

Phylum Annelida 19

Class Polychaeta 19

Class Oligochaeta 22

Phylum Arthropoda 22

Class Pycnogonida - sea spiders 22

Class Cirripedia 23

Class Malacostraca 23

Order Euphausiacea 23
Order Decapoda 23
Order Mysidacea 24
Order Cumacea 24
Order Isopoda 24
Order Amphipoda 25
Phylum Bryozoa 25
Phylum Echinodermata 25
Class Stelleroidea 25
Class Echinodea 26
Phylum Chordata 26
Class Ascidiacea 26
Acknowledgements 26
References 26

ABSTRACT

Moore, D.S., N. Drummond-Davis, and R.J. Miller. 1982. A review of feeding types of benthic invertebrates collected in a small cove on the south shore of Nova Scotia. Can. MS Rep. Fish. Aquat. Sci. 1673: vi + 29 p.

Benthic samples were collected in a small cove on the south shore of Nova Scotia. All macroinvertebrates were sorted and identified to species where possible and to a more general taxonomic grouping where identification was difficult. Each taxonomic grouping found was assigned, based on a review of the literature, to one of the following feeding types: 1) carnivore, 2) herbivore, 3) omnivore, 4)deposit feeder, and 5) suspension feeder. A summary of the literature reviewed is presented by taxonomic grouping with references. Results of the review are also given in tabular form with size ranges of each taxonomic grouping identified and food consumed.

Key words: Benthos, invertebrates, feeding, Nova Scotia.

RÉSUMÉ

Moore, D.S., N. Drummond-Davis, and R.J. Miller. 1982. A review of feeding types of benthic invertebrates collected in a small cove on the south shore of Nova Scotia. Can. MS Rep. Fish. Aquat. Sci. 1673: vi + 29 p.

Des échantillons de la faune benthique d'une petite anse de la côte sud de la Nouvelle-Écosse ont été prélevés. Tous les macro-invertébrés ont été triés it, autant que possible, identifiés à l'espèce ou, dans les cas où l'identification était

plus difficile, à un groupe taxonomique plus général. Chaque groupe da ensuite été classé selon un des types d'alimentation suivants: 1) carnivore, 2) herbivore, 3) omnivore, 4) consommant des organismes déposés, et 5) consommant des organismes en suspension. Les travaux publiés ont été analysés par groupe taxonomique, et un résumé présenté, avec références. Les résultats de cette analyse sont également présentés sous forme de tableau, avec extrêmes de taille pour chaque groupe taxonomique identifié, avec type de nourriture consommée.

INTRODUCTION

From November, 1980, to April, 1982, benthic samples were collected in Coyle Cove, N.S. (Fig. 1) as part of a community study of macrophyte beds and sea urchin grazed areas devoid of macrophytes. This classification of the benthos into feeding types will be used to contrast the food webs in the two areas in a future report. Animals collected were usually identified to the taxonomic grouping where feeding type was uniform within. The feeding types were determined from a review of the published literature. The findings of that review are the subject of this report.

Feeding types were defined as follows:

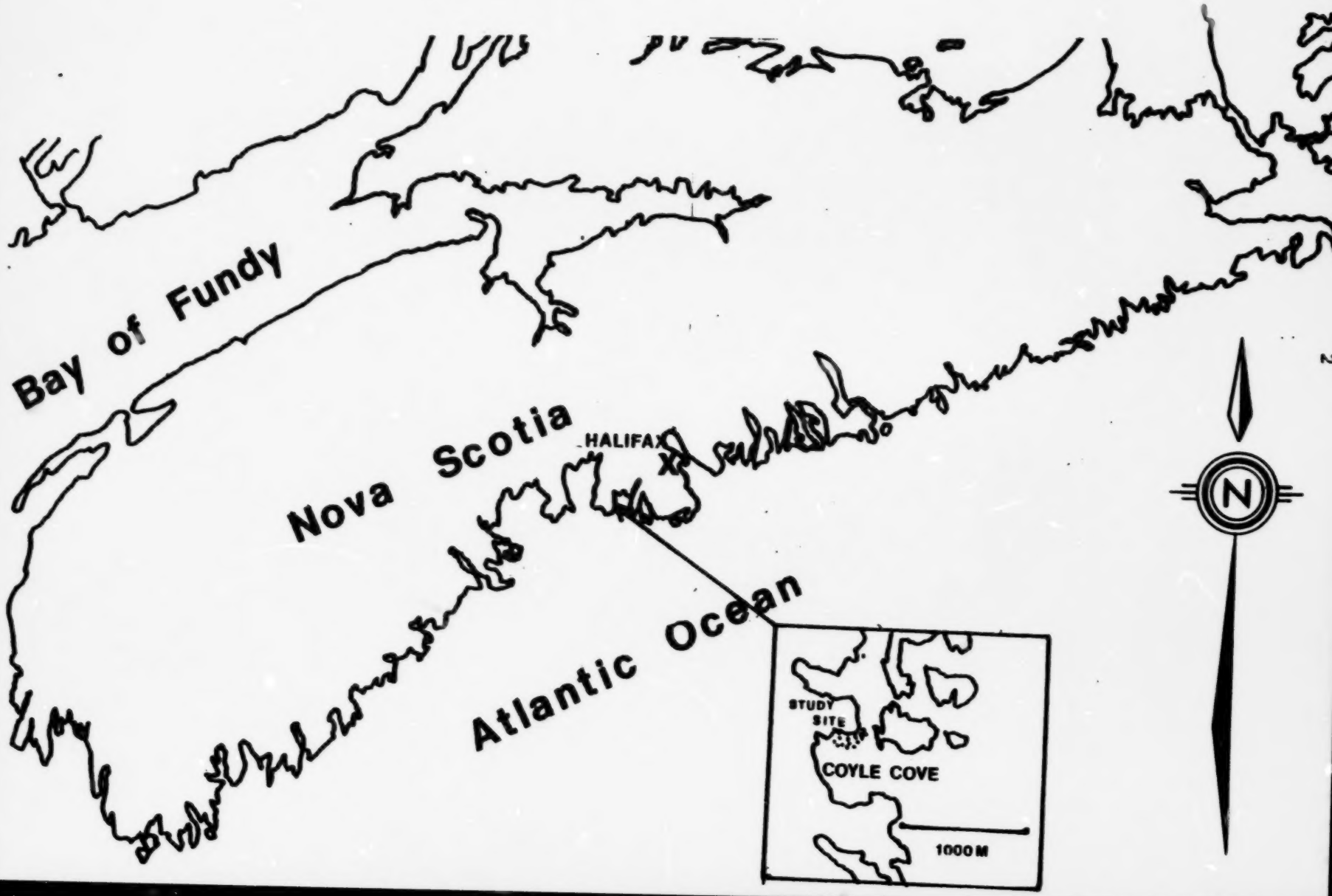
1) Carnivores: Hunters and foragers, feeding principally on other animals;
2) Herbivores: Grazers, feeding principally on macroscopic plants;
3) Omnivores: Feeding on a combination of animals, plants, and detritus;
4) Deposit feeders: Ingesting sediment particles to absorb microorganisms and/or organic detritus; and
5) Suspension feeders: feeding on small particles suspended in the surrounding water, e.g. phytoplankton, microzooplankton, detritus, and bacteria.

When, according to the literature reviewed, an organism was described as fitting into more than one feeding type, the organism was assigned to the feeding type which provided the major source of its nutritional requirements. For example, lobsters (Homarus americanus), cancer crabs (Cancer sp.), and green crabs (Carcinus maenas) were described as functional carnivores because more than 75% of their diet was made up of live animal matter. Uptake of dissolved organic matter was not included as a feeding type since its nutritional importance to benthic animals has rarely been quantified in feeding studies.

Fish and internal parasites were excluded since fish feeding will be the subject of another report. However, small individuals of the following fish species were found in the benthic samples: Anarchichas lupus (wolffish), Liparis sp. (seasnail), Myxocephalus aeneus (grubby), Pholis gunnelis (rock gunnel), and Tautoglobrus adspersus (cunner).

The first section of the review is a summary of the literature which describes the feeding activities by taxonomic groupings of the animals found at Coyle Cove. Where species

Figure 1. Map of Nova Scotia showing the location of the Coyle Cove study area.



were identified, information on their feeding was included within the appropriate family grouping. When identification was difficult, organisms were placed in more general taxonomic groupings such as class or family. This sometimes led to confusion since these general groupings may contain several feeding types. In these cases all feeding types are described, and the most commonly used one within that group was concluded as its feeding type. For quick reference the following coding for feeding type was placed on the right margin opposite each taxonomic grouping described:

C - Carnivore
H - Herbivore
O - Omnivore
DF - Deposit feeder
SF - Suspension feeder

Secondly, Tables 1 through 5 present the animals by feeding type. Included is information on size of the organisms encountered and food consumed (from published reports reviewed). Taxonomic classification is based on Barnes (1980).

STUDY AREA

Coyle Cove is a coastal embayment sheltered from ocean swells. Strong winds from the south or southeast can produce wave heights of 1.5 m, but wave heights of less than 0.5 m are usual. Substrate sampled ranged from bedrock to large cobble and from 1 m to 8 m below mean low water. At 8-10 m the substrate changed abruptly to silty gravel. When cobble was present animals were collected only to beneath the first layer of cobble. Sampling was stratified by vegetation cover: 1) bottom maintained free of macrophyte by grazing sea urchins; 2) bottom from which urchins had been removed in the spring of 1981 and which was colonized by filamentous algae and kelp (Laminaria longicruris); and 3) bottom 100% covered by a mature macrophyte bed. This mature bed was principally Chondrus crispus to 2 m deep and Laminaria longicruris deeper. Filamentous algae were seasonally abundant.

COLLECTION METHODS

Two types of samples were taken. Animals greater than 8 mm diameter (could not fit through a 8 mm diameter hole) were collected by a scuba diver by hand using a 0.4 m^2 quadrat.

TABLE 1. Size range and food of benthic carnivores collected in Coyle Cove.

Taxonomic Group	Size Range	Food	References
Phylum Cnidaria:			
Class Scyphozoa			
Order Stauromedusae	height to 20 mm	annelids, plankton, and small invertebrates	Barnes, 1980; Gosner, 1978
Class Anthozoa			
Family Metridiae			
Metridium senile	height to 100 mm	invertebrates and small fish	Barnes, 1980; Gosner, 1978
Phylum Platyhelminthes:			
Class Turbellaria	length to 5 mm	small invertebrates and moribund animals	Barnes, 1980; Gosner, 1978
Phylum Rhynchocoela:	length to 30 mm	small invertebrates	Barnes, 1980; Gosner, 1978
Phylum Mollusca:			
Class Gastropoda			
Family Buccinidae			
Buccinum undatum	height to 25 mm	bivalves and moribund animals	Barnes, 1980; Fretter and Graham, 1962; Purchon, 1968
Neptunea decemcostata	height to 50 mm	bivalves and moribund animals	Barnes, 1980; Fretter and Graham, 1962; Purchon, 1968
Family Columbellidae			
Mitrella lunata	height to 6 mm	bivalves	Gosner, 1978; Radwin, 1972
Family Corophellidae			
Corophella sp.	length to 25 mm	hydroids	Graham, 1955
Family Lamellariidae			
Velutina sp.	length to 15 mm	colonial hydroids and tunicates	Fretter and Graham, 1962; Gosner, 1978
Family Muricidae			
Thais lapillus	height to 20 mm	bivalves and barnacles	Barnes, 1980; Gosner, 1978
Family Nassariidae			
Nassarius trivitattus	height to 15 mm	moribund animals and *Lacuna* sp. eggs	Barnes, 1980; MacGinitie and MacGinitie, 1968; Purchon, 1968
Family Naticidae			
Natica sp.	height to 6 mm	bivalves and brachiopods	Barnes, 1980; Gosner, 1978; Purchon, 1968
Polinices sp.	height to 25 mm	bivalves and brachiopods	Barnes, 1980; Gosner, 1978; Purchon, 1968

... Cont'd

TABLE 1. (Cont'd)...

Taxonomic Group	Size Range	Food	References
Family Onchidoridae			
Acanthodoris pilosa	length to 10 mm	encrusting bryozoans	Gosner, 1978; Graham, 1955
Family Polyceridae			
Polycera dubia	length to 10 mm	bryozoans and hydroids	Gosner, 1978; Graham, 1955
Family Pyramidellidae			
Turbonilla sp.	length to 6 mm	polychaetes and bivalves	Gosner, 1978; Purchon, 1968
Family Retusidae			
Retusa sp.	height to 3 mm	*Hydrobia* sp.	Gosner, 1978; Graham, 1955; Younge and Thompson , 1976
Family Turridae			
Lora sp.	height to 5 mm	N.A.	Barnes, 1980; Morris, 1973; Purchon, 1968
Phylum Annelida:			
Class Polychaete			
Family Goniadidae	length to 20 mm	N.A.	Appy et al., 1980; Fauchald and Jumars, 1979
Family Lumbrineridae			
Lumbrinis sp.	length to 45 mm	polychaetes, nemerteans, crustaceans, and molluscs	Appy et al., 1980; Fauchald and Jumars, 1979
Family Nephtyidae	length to 55 mm	polychaetes, crustaceans, and molluscs	Appy et al., 1980; Barnes, 1980; Fauchald and Jumars, 1979
Family Phyllodocidae	length to 70 mm	polychaetes	Appy et al., 1980; Barnes, 1980; Fauchald and Jumars, 1979
Family Polynoidae			
Harmothoe imbricata	length to 15 mm	crustaceans, polychaetes, gastropods, hydroids, and sponges	Appy et al., 1980; Fauchald and Jumars, 1979
Family Sigalionidae	length to 15 mm	polychaetes and various small invertebrates.	Appy et al., 1980; Fauchald and Jumars, 1979
Family Syllidae	length to 10 mm	colonial invertebrates and occasionally detritus	Appy et al., 1980; Fauchald and Jumars, 1979
Phylum Arthropoda:			
Class Pycnogonida	to 10 mm leg span	hydroids, corals, anemones, bryozoans, and detritus	Barnes, 1980; Gosner, 1978

... Cont'd

TABLE 1. (Cont'd)...

Taxonomic Group	Size Range	Food	References
Class Malacostraca			
Order Decapoda			
Family Cancridae			
Cancer irroratus	to 90 mm carapace width	invertebrates, moribund animals	Bigford, 1979; Scarratt and Lowe, 1972
C. borealis	to 110 mm carapace width	N.A.	
Family Crangonidae			
Crangon septemspinosa	length to 40 mm	Mysids, amphipods, small gastropods	Gosner, 1978; Squires, 1965
Family Nephropsidae			
Homarus americanus	length to 500 mm*	decapods molluscs, echinoderms, polychaetes; sometimes dead fish or algae	Barnes, 1980; Carter and Steele, 1982; Scarratt, 1980
Family Portunidae			
Carcinus maenas	to 55 mm carapace width	mostly molluscs; sometimes polychates, arthropods dead fish, or algae	Ropes, 1968
Order Amphipoda			
Family Caprellidae	to 20 mm leg span	mostly crustaceans sometimes diatoms, detritus, or suspended particles	Caine, 1974; Laubitz, 1972
Phylum Echinodermata:			
Class Stelleroidea			
Family Asteriidae			
Asterias forbesii	to 70 mm arm span	bivalves, gastropods, polychaetes, crustaceans, echinoderms, and dead fish	Barnes, 1980; Ferguson, 1969
A. vulgarus	to 90 mm arm span	bivalves, gastropods, polychaetes, crustaceans, echinoderms, and dead fish	Barnes, 1980; Ferguson, 1969

* Note: Large individuals were not susceptible to our sampling gear but individuals up to this size were observed in the sample area.

TABLE 2. Size range food of benthic herbivores collected in Coyle Cove.

Taxonomic Group	Size Range	Food	References
Phylum Mollusca:			
Class Polyplacophora			
Family Ischnochitonidae	length to 38 mm	algae; occasionally sponges and bryozoans	Barnes, 1980; Gosner, 1978
Class Gastropoda			
Family Acmaeidae			
Acmaea testudinalis	length to 25 mm	algae; occasionally sponges and bryozoans	Barnes, 1980; Gosner, 1978
Family Lacunidae			
Lacuna vincta	height to 12 mm	*Laminaria* and *Fucus*	Barnes, 1980; Fretter and Graham, 1962; Newell, 1970; Purchon, 1968
Family Littorinidae			
Littorina littorea	height to 31 mm	fucus, detached seaweed, and diatoms	Barnes, 1980; Fretter and Graham, 1962; Newell, 1970; Purchon, 1968
L. saxatalis	height to 12 mm	detached seaweed and diatoms	Barnes, 1980; Fretter and Graham, 1962; Newell, 1970; Purchon, 1968
Family Skeneopsidae			
Skeneopsis planorbis	width to 3 mm	*Cladophora*, *Pylaiella*, *Ectocarpus*, *Polysiphonia*, and *Plocamium*	Barnes, 1980; Gosner, 1978; Purchon, 1968
Family Trochidae			
Calliostoma occidentale	height to 12 mm	attached algae	Barnes, 1980; Gosner, 1978; Purchon, 1968
Margarites sp.		attached algae	Barnes, 1980; Gosner, 1978; Purchon, 1968
Phylum Arthropoda:			
Class Malacostraca			
Order Isopoda			
Family Idoteidae			
Idotea baltica	length to 15 mm	*Fucus* and occasionally animals	Naylor, 1975; Rasmussen, 1973
Edotea triloba	length to 5 mm	N.A.	Naylor, 1975; Rasmussen, 1973

... Cont'd

TABLE 2. (Cont'd)...

Taxonomic Group	Size Range	Food	References
Phylum Echinodermata:			
Class Echinodea			
Family Strongylocentrotidae			
Strongylocentrus droebachiensus	to 75 mm dia.	attached algae, algal detritus, and occasionally animals	Lawrence, 1975

TABLE 3. Size range and food of benthic omnivores collected in Coyle Cove.

Taxonomic Group	Size Range	Food	References
Phylum Annelida:			
Class Polychaeta			
Family Nereidae			
Nereis virens	length to 100 mm	invertebrates and algae	Appy et al., 1980; Fauchald and Jumars, 1979; Rasmussen, 1973
Phylum Arthropoda:			
Class Malacostraca			
Order Euphausidae			
Family Euphausidae	length to 15 mm	crustaceans, diatoms, detritus, dinoflagellates, tintinnids, radiolarians coccolithophores, *Sagitta*, algae, and ommatidia	Barnes, 1980; Mauchline and Fischer, 1969
Order Decapoda			
Family Hippolytidae			
Eualis gaimardi	length to 40 mm	phytobenthos, ostracods, crustaceans, foraminifera, and polychaetes	Gosner, 1978; Squires, 1965
E. pusiolus	length to 15 mm	N.A.	Gosner, 1978
Lebbeus polaris	length to 40 mm	phytobethos, crustaceans, ostracods, amphipods; sometimes polychaetes	Gosner, 1978; Squires, 1965
Family Majiidae			
Hyas coarctatus	to 31 mm carapace width	phytobenthos, crustaceans, foraminifera, ophiuroids, pelecypods, crabs, sea urchins, and gastropods	Gosner, 1978; Squires, 1965
Family Paguridae			
Pagurus acadianus	length to 35 mm	hydroids foraminifera, small crustaceans, and phytobenthos	Gosner, 1978; MacGinitie and MacGinitie, 1968
P. arcuatus	length to 15 mm	hydroids foraminifera, small crustaceans, and phytobenthos	Gosner, 1978; MacGinitie and MacGinitie, 1968
Order Mysidacea			
Family Mysidae			
Mysis stenolepis	length to 15 mm	zooplankton, phytoplankton, and detritus	Barnes, 1980; Gosner, 1978; Tottersall and Tattersall, 1951

TABLE 4. Size range and food of benthic deposit feeders collected in Coyle Cove.

Taxonomic Group	Size Range	Food	References
Phylum Nematoda:	length to 10 mm	sediment particles* and bacteria	Gosner, 1978; Nicolas, 1975
Phylum Mollusca:			
Class Gastropoda			
Family Diaphanidae			
Diaphana minuta	height to 2 mm	N.A.	Gosner, 1978; Morton, 1967
Family Hydrobiidae			
Hydrobia minuta	height to 3.5 mm	sediment particles, diatoms, and bacteria	Barnes, 1980; Fenchel et al., 1975; Morris, 1973
Family Rissoidae			
Cingula sp.	height to 2 mm	detritus	Morris, 1973; Fretter and Graham, 1962
Class Bivalvia			
Family Nuculidae			
Nucula proxima	length to 5 mm	sediment particles; occasionally suspended particles	Barnes, 1980; Gosner, 1978; Purchon, 1968
Family Nuculanidae			
Nuculana sp.	length to 10 mm	sediment particles; occasionally suspended particles	Barnes, 1980; Gosner, 1978; Purchon, 1968
Yoldia sp.	length to 25 mm	sediment particles; occasionally suspended particles	Barnes, 1980; Gosner, 1978; Purchon, 1968
Family Tellinidae			
Tellina sp.	length to 12 mm	organic detritus, benthic microoganisms	Gosner, 1978; Purchon, 1968
Phylum Annelida:			
Class Polychaeta			
Family Ampharetidae	length to 10 mm	detritus, unicellular algae, and larval invertebrates	Appy et al., 1980; Barnes, 1980; Fauchald and Jumars, 1979
Family Cirratulidae	length to 20 mm	surface detritus particles	Appy et al., 1980; Fauchald and Jumars, 1979

*"sediment particles" is the term used in the references, but nutritional requirements are gleaned from organic matters (organic detritus and microorganisms) found on the sediment particles.

... Cont'd

TABLE 4. (Cont'd)...

Taxonomic Group	Size Range	Food	References
Class Polychaeta (cont'd)			
Family Flabelligeridae	length to 10 mm	surface despaits; faecal matter	Appy et al., 1980; Fauchald and Jumars, 1979
Family Maldanidae	length to 15 mm	sediment particles	Appy et al., 1980; Fauchald and Jumars, 1979
Family Opheliidae	length to 15 mm	sediment particles	Appy et al., 1980; Barnes, 1980; Fauchald and Jumars, 1979
Family Orbiniidae	length to 35 mm	sediment particles	Appy et al., 1980; Fauchald and Jumars, 1979
Family Pectinariidae	length to 20 mm	sediment particles	Barnes, 1980; Fauchald and Jumars, 1979; MacGinitie and MacGinitie, 1968
Family Scalibregmidae	length to 15 mm	sediment particles	Appy et al., 1980; Fauchald and Jumars, 1979
Family Sphaerodoridae	length to 15 mm	sediment particles	Appy et al., 1980; Fauchald and Jumars, 1979
Family Spionidae	length to 35 mm	surface deposits and plankton	Appy et al., 1980; Barnes, 1980; Fauchald and Jumars, 1979
Family Terebellidae	length to 35 mm	surface deposits and plankton	Appy et al., 1980; Fauchald and Jumars, 1979
Class Oligochaeta	length to 45 mm	sediment particles	Barnes, 1980; Gosner, 1978
Phylum Arthropoda:			
Class Malacostraca			
Order Cumacea			Barnes, 1980; Gosner, 1978
Family Diastylidae			Barnes, 1980; Gosner, 1978
Diastylis quadrispinosa	length to 8 mm length to 25 mm	organic detritus surface deposits and suspended detritus	
Order Amphipoda			
Phylum Echinodermata:			
Class Stelleroidea			Barnes, 1980; Ferguson, 1969
Family Echinasteridae			
Henrica sp.	to 35 mm arm span	detritus and plankton	Barnes, 1980; Gosner, 1978
Family Goniopectinidae			
Ctenodiscus crispatus	to 50 mm arm span	sediment particles and plankton	

TABLE 5. Size range and food of benthic suspension feeders collection in Coyle Cove.

Taxonomic Group	Size Range	Food	References
Phylum Porifera:			
Class Calcarea	colony height to 15 mm	small organic particle, bacteria, and plankton	Barnes, 1980; Gosner, 1978
and			
Class Desmospongia	colony height to 15 mm		
Phylum Mollusca:			
Class Gastropoda			
Family Calyptraeidae			
Crepidula fornicata	length to 50 mm	suspended particles and plankton	Barnes, 1980; Gardiner, 1972
Class Bivalvia			
Family Cardiidae			
Cerastoderma pinnulatum	length to 10 mm	algal spores, diatoms, fragmented or filamentous algae	Barnes, 1980; Graham, 1955
Family Hiatellidae			
Hiatella arctica	length to 20 mm	suspended particles	Barnes, 1980; Morris, 1973
Family Mytilidae			
Mytilus edulis	length to 60 mm	diatoms, dinoflagellates, and suspended particles	Barnes, 1980; Graham, 1955; Morris, 1973
Modiolus modiolus	length to 100 mm	diatoms, dinoflagellates, and suspended particles	Barnes, 1980; Graham, 1955; Morris, 1973
Musculus sp.	length to 2 mm	diatoms, dinoflagellates, and suspended particles	Barnes, 1980; Graham, 1955; Morris, 1973
Crenella sp.	length to 20 mm	diatoms, dinoflagellates, and suspended particles	Gosner, 1978
Family Ostreidae			
Crassostrea virginia	length to 15 mm	suspended particles	Gosner, 1978; Purchon, 1968
Family Solenidae			
Ensis sp.	length to 100 mm	suspended particles	
Phylum Annelida:			
Class Polychaeta			
Family Sabellidae	length to 125 mm	suspended particles	Appy et al., 1980; Fauchald and Jumars, 1979
Family Serpulidae	length to 75 mm	suspended particles	Appy et al., 1980; Fauchald and Jumars, 1979

... Cont'd

TABLE 5. (Cont'd)...

Taxonomic Group	Size Range	Food	References
Phylum Arthropoda:			
Class Cirripedia			
Family Balanidae			
Balanus balanoides	dia. to 15 mm	suspended particles	Barnes, 1980; Newell, 1970
Phylum Bryozoa:	colony length to 70 mm	phytoplankton, bacteria, and zooplankton	Barnes, 1980; Gosner, 1978
Phylum Echinodermata:			
Class Stelleroidea			
Family Ophiactidae			
Ophiopholis aculeata	to 19 mm disc dia.	suspended particles and plankton	Barnes, 1980; Gosner, 1978
Phylum Chordata:			
Class Ascidiacea	height to 15 mm	suspended particles and plankton	Barnes, 1980

Smaller animals were collected using a 0.065 m^2 quadrat which was sampled by a scuba diver using an air-lift sampler with a 1 mm mesh collecting bag. Plants and attached animals were removed from the rocks with a paint scraper. Samples from large quadrats were frozen, while samples from small quadrats were preserved in 10% buffered formalin in seawater. All samples were sorted in the laboratory.

TAXONOMIC GROUPINGS

PHYLUM PORIFERA - SPONGES

Classes Calcarea and Desmospongia — SF

Sponges are filter-feeding colonial animals. Only 20% of the diet is made up of particles larger than 5 microns in diameter. Sponges were identified only to class (Barnes, 1980; Gosner, 1978).

Class Scyphozoa — C

Order Stauromedusa: Stauromedusae are sessile jellyfish attached by a stalk to algae, rock, or shells. They are carnivores, using nematocysts (stinging cells) on their tentacles to paralyze prey (Barnes, 1980; Gosner, 1978).

Class Anthozoa

Family Metridiidae - Sea anemones: Sea anemones are carnivorous, sessile polyps. Prey are paralyzed by nematocysts and transported to the mouth by tentacular contractions. The common sea anemone, Metridium senile, was encountered in Coyle Cove. Although it was abundant, the sea anemone was difficult to remove from the substrate and was often left out of samples for this reason (Barnes, 1980; Gosner, 1978). — C

PHYLUM PLATYHELMINTHES - FLATWORMS

Class Turbellaria — C(H)

Most free-living turbellarians are carnivores feeding on a variety of the invertebrates as well as moribund animals. A few species are herbivores feeding on diatoms and macroscopic algae. Turbellarians were rarely vulnerable to our sampling methods. They were identified only to class (Barnes, 1980; Gosner, 1978).

PHYLUM RHYNCHOCOELA - PROBOSCIS WORMS

Adult proboscis worms are carnivorous, feeding on invertebrates and fish. Prey is seized with a large proboscis which is shot out and wrapped around the prey. They were identified only to phylum (Barnes, 1980; Gosner, 1978).

PHYLUM NEMATODA - ROUNDWORMS

Free-living marine nematodes are small, never over 25 mm in length, and usually were not vulnerable to our sampling methods. About half of all marine nematodes are deposit feeders, so this feeding type was used for all nematodes found in our samples. Other nematodes are either carnivores or herbivores (Gosner, 1978; Nicolas, 1975).

PHYLUM MOLLUSCA

Class Polyplacophora - Chitons

Chitons are microphagous herbivores, scraping algae and other encrusting organisms off rocks, seaweeds, and other shellfish. Since all chitons are herbivores they were identified only to class (Barnes, 1980; Gosner, 1978).

Class Gastropoda

Family Acmaeidae - Limpets: Limpets are microphagous herbivores scraping algae and other encrusting organisms off rocks, seaweeds, and other shellfish. The tortoiseshell limpet, Acmaea testudinalis, was abundant in Coyle Cove (Barnes, 1980; Gosner, 1978).

Family Buccinidae - Whelks: Whelks are carnivores, preying on bivalves and scavenging. They are found in the lower intertidal and subtidal zones. The common northern whelk, Buccinum undatum, and the ten-ridged whelk, Neptunea decemcostata, were identified in samples from Coyle Cove (Barnes, 1980; Fretter and Graham, 1962; Purchon, 1968).

Family Calyptraeidae - Slipper shells: Slipper shells are sessile, filter-feeding gastropods. Cilia on the gill filaments filter food particles as do the bivalves. The feeding organ of other gastropods, the radula, is used only as an anchor. Crepidula fornicata, the slipper limpet, occurs in our sampling area (Barnes, 1980; Gardiner, 1972).

Family Columbellidae - Dove shells: Two subfamilies with different feeding types comprise this group. Mitrella lunata, the species encountered in Coyle Cove, is a member of the subfamily Pyreninae. Few studies have been made of this subfamily and most are thought to be carnivorous. Mitrella ocellata, a closely related species, preys on bivalves (Gosner, 1978; Radwin, 1977). C

Family Coryphellidae - Red-grilled nudibranchs: Carnivorous nudibranchs of the genus Coryphella were found in Coyle Cove. They are reported to prey on hydroids (Graham, 1955). C

Family Diaphanidae - Paper bubble shells: Few studies have been made on this family of primative opisthobranchs. Closely related families, the Ringiculidae and Acteonidae are mostly burrowing deposit feeders. It is postulated that the Diaphanidae are also deposit feeders because of their structural similarity to these families. The arctic paper bubble shell, Diaphana minuta (to 5 mm) was found in Coyle Cove (Gosner, 1971; Morton, 1967). DF

Family Hydrobiidae: Hydrobiids are mainly size-selective deposit feeders, although one species, Hydrobia ulvae, has been reported to supplement this diet by feeding on bacteria in the surface film on incoming tides. Hydrobia minuta (to 3.5 mm) occurs in Coyle Cove (Barnes, 1980; Fenchel et al., 1975; Morris, 1973). DF

Family Lamellariidae - Wide-mouthed snails: Lamellarids are carnivorous snails feeding on sedentary colonial hydroids and tunicates. Velutina sp. (to 2.0 mm) was found in Coyle Cove (Fretter and Graham, 1962; Gosner, 1978). C

Family Littorinidae - Periwinkles: Periwinkles are herbivores. Two species were found in Coyle Cove. Littorina littorea (to 42 mm) feeds on fucus, detached seaweed, diatoms, and lichens. Littorina saxatilis (to 18 mm) feeds on detached seaweed and diatoms (Barnes, 1980; Fretter and Graham, 1962; Newell, 1970; Purchon, 1968). H

Family Muricidae - Drills: The drills are carnivores and use a combination of rasping with the radula and acid secretions to penetrate the shells of bivalves and barnacles. Flesh is then torn from the prey by extending the radula into the mantle cavity of the prey. Thais lapillus (to 46 mm), the Atlantic dogwinkle, was identified in the sample area (Barnes, 1980; Gosner, 1978). C

Family Lacunidae: Lacuna are herbivores. Lacuna vincta, found in Coyle Cove, feeds on Laminaria and Fucus (Fretter and Graham, 1962).

Family Nassaridae - Mud snails: Nassarius trivitattus was found in Coyle Cove. They are scavenging carnivores feeding on dead or decaying animals. They are also reported to feed on the eggs of Lacuna sp. during its breeding season (Barnes, 1980; Gosner, 1978; MacGinitie and MaGinitie, 1968; and Purchon, 1968).

Family Naticidae - Moon shells: Moon shells are carnivores which prey on bivalves and brachiopods in the same manner as the Muricidae. They do, however, have specific sites on the shells which they select to drill. Natica sp. and Polinices sp. were found in the sample area. Each has an inflatable foot for burrowing in search of prey (Barnes, 1980; Gosner, 1978; and Purchon, 1968).

Family Onchidoridae - Rough-mantled nudibranchs: These nudibranchs are carnivores specialized in feeding on bryozoans. The species Acanthodoris pilosa was found in Coyle Cove (Gosner, 1978; Graham, 1955).

Family Polyceridae - Rim-backed nudibranchs: Rim-backed nudibranchs are carnivores which feed on hydroids and bryozoans. The species Polycera dubia was found in our study area (Gosner, 1978; Graham, 1955).

Family Pyramidellidae: Members of this family are reported to be ecto-parasites of polychaetes and bivalves. Since they feed on live animal matter they were classfied as carnivores. The end of their proboscis is modified to form a sucker and stylet for holding and piercing the body wall of the host. Turbonilla sp. was found in Coyle Cove (Gosner, 1978; Purchon, 1968).

Family Retusidae - Barrel bubble shells: Retusa obtusa is a burrowing carnivore feeding on the deposit feeding gastropod Hydrobia sp. Retusa sp. was found in Coyle Cove and was assumed to have similar feeding habits (Gosner, 1978; Graham, 1955; Younge and Thompson, 1976).

Family Rissoidae: Cingula sp. was identified in the sample area. These small gastropods are reported to feed on detritus (Morris, 1973; Fretter and Graham, 1962).

Family Skeneopsidae - Orb shell: Skeneopsis planorbis was found in Coyle Cove. It is a herbibore feeding on Cladophora, Pylaiella, Ectocarpus, Polysiphonia, and Plocamium. These gastropods are found on sponges, coral, shells, and seaweeds in shallow water (Barnes, 1980; Gosner, 1978; Purchon, 1968).

Family Trochidae - Top shells: Top shells are herbivores, grazing on filamentous algae. The pearly top shell, Callistoma occidentale and Margarites sp., were found in the sample area (Barnes, 1980; Gosner, 1978; Purchon, 1968). H

Family Turridae - Turret shells: Turret shells are presumed to be carnivores which sting and kill their prey before consuming it. Feeding studies have not been published but these gastropods do possess a poison gland and the most closely related family, the cone shells, are carnivorous. Lora sp. were found in Coyle Cove (Barnes, 1980; Morris, 1973; Purchon, 1968). C

Class Bivalvia

Family Cardiidae - Cockles: Cockles are sessile filter feeders. They are reported to feed on algae spores, diatoms, and fragmented or filamentous algae. Cerastoderma pinnulatun was found in our samples (Barnes, 1980; Graham 1955). SF

Family Hiatellidae - Rock borers: Rock borers are filter-feeding bivalves which bore into soft rocks, sponges, or mud to make protective burrows. A siphon is then extended from the burrow for feeding. Hiatella arctica, the arctic rock borer, was found in Coyle Cove (Barnes, 1980; Morris, 1973). SF

Family Mytilidae - Mussels: Mussels are filter-feeding sessile bivalves. They can filter particles as small as 1-2 microns in diameter, and feed on several species of diatoms and dinoflagellates. Mussels attach themselves to solid substrate by means of a byssal threads. Mytilus edulus, Modiolus modiolus, Musculus sp., and Crenella sp. were found in the sample area (Barnes, 1980; Graham, 1955; Morris, 1973). SF

Family Nuculidae - Nut shells: Nut shells belong to the oldest group of bivalves, the subclass Protobranchia. They are deposit feeders, which is believed to be the ancestral feeding mode of the bivalves. Tentacles are extended into the sediment and cilia on these transport food particles into the mantle cavity. Nucula proxima, the Atlantic nut shell, was found in Coyle Cove (Barnes, 1980; Gosner, 1978; Purchon, 1968). DF

Family Nuculanidae - Nut shells: These nut shells are close relatives of the Nuculidae and are also mainly deposit feeders. Feeding is carried out in the same manner except in this group there is partial filter feeding. Yoldia sp. and Nuculana sp. were found in Coyle Cove (Barnes, 1980; Gosner, 1978; Purchon, 1968). DF

Family Ostreidae - Oysters: Oysters are sessile filter feeders. One small oyster, Crassostrea virginia, was found in Coyle Cove (Gosner, 1978).

Family Solenidae - Razor clams: Razor clams are filter feeders with special adaptation for living in silty water. A coarse filter removes unwanted sediment before inhalant water reaches the fine feeding filter. Ensis sp. were found in Coyle Cove (Gosner, 1978; Purchon, 1968).

Family Tellinidae - Tellins: Although tellins are not primitive bivalves they have reverted to the ancestral deposit feeding mode of the bivalves. The inhalant siphon is used as a vacuum cleaner to pick up organic detritus on the bottom. It is suspected that they feed only on the flora of micro-organisms growing on the sediment. Tellina sp. were found in the sampled area (Gosner, 1978; Purchon, 1968).

PHYLUM ANNELIDA

Class Polychaeta

Family Ampharetidae: Ampharetids are surface deposit feeders using retractable tentacles to pick up food particles. They construct tubes of mucus covered with sediment and locomotion is achieved by continuous tube building. Ingested material includes detritus, unicellular algae, and larval invertebrates. No identifications more specific than the family level were made (Appy et al., 1980; Barnes, 1980; Fauchald and Jumars, 1979).

Family Cirratulidae: Cirratulids are jawless polychaetes with either two groups or a single pair of palps attached anteriorly. They are surface deposit feeders using these palps for food collection (Appy et al., 1980; Fauchald and Jumars, 1979).

Family Flabelligeridae: Flabelligerids are non-tubiculous (tubiculous = tube dwelling) worms often covered with thick mucus sheaths or sand encrustations. They are surface deposit feeders using grooved palps to gather food. One species is a commensal with the sea urchin feeding on its faecal matter (Appy et al., 1980; Fauchald and Jumars, 1979).

Family Goniadidae: Goniadids are long, thin non-tubiculous worms with a conical prostomia (prostomis = first of the two head segments) and a large jawed eversible proboscis. Based on morphology they are postulated to be carnivores. Feeding studies have not been published on this family (Apply et al., 1980; Fauchald and Jumars, 1979). C

Family Lumbrineriidae: Lumbrinerids are long, slender, burrowing worms with jaws on their eversible proboscis. Most species are carnivores feeding on nemerteans, polychaetes, small crustaceans, and bivalves. The remaining species are surface deposit feeders and there is one unsubstantiated report of a herbivorous species. Since identification was only to the family level, all were grouped as carnivores for our study (Appy et al., 1980; Fauchald and Jumars, 1979). C(DF,H)

Family Maldanidae - Bamboo worms: Bamboo worms are tubiculous deposit feeders which seize food particles by everting a sac-like proboscis. They feed at the bottom of their tubes and movement is achieved by continuous tube building. Reports have shown that the speed of tube building is proportional to the organic content of the sediment (Appy et al., 1980; Barnes, 1980; Fauchald and Jumars, 1979). DF

Family Nephtyidae: Nephtyids are active crawling and burrowing carnivores. They feed on molluscs, crustaceans, and other polychaetes which are caught with a large eversible proboscis armed with internal jaws. One report has been made of a deposit feeding population of nephtyids (Appy et al., 1980; Barnes, 1980; Fauchald and Jumars). C

Family Nereidae: Nereis virens was found in Coyle Cove. It is a discretely motile, tubiculous omnivore feeding on a variety of small animals, detritus, and algae. A population studied near Woods Hole was found to be herbivorous. This hints that availability of food may determine the feeding type of these worms in a given area (Appy et al., 1980; Fauchald and Jumars, 1979; Rasmussen, 1973). O

Family Opheliidae: Opheliids are burrowing deposit feeders which ingest sediments and absorb the organic matter from them at a very high rate of efficiency (96% in one report). It is postulated that these worms will show selectivity in organic matter they absorb (Appy et al., 1980; Barnes, 1980; Fauchald and Jumars, 1979). DF

Family Orbiniidae: Orbiniids are burrowing deposit feeders They feed at the bottom of their burrows using a sac-like eversible proboscis to seize sediment (Appy et al., 1980; Fauchald and Jumars, 1979). DF

Family Pectinariidae - Cone worms: Cone worms are burrowing deposit feeders which build conical tubes. Like the bamboo worms they move by continuous tube building, the rate of which is determined by organic content of the sediment. They are reported to selectively absorb about 20% of the organic matter ingested. Feeding is carried out by ciliated tentacles (Barnes, 1980; Fauchald and Jumars, 1979; MacGinitie and MacGinitie, 1968).

Family Phyllodocidae: Phyllodocids are non-tubiculous carnivores which seize their prey with an eversible proboscis. They are usually selective in their feeding habits and it is postulated they follow mucus trails to locate their prey guided by olfactory search images (Appy et al., 1980; Barnes, 1980; Fauchald and Jumars, 1979).

Family Polynoidae - Scale worms: Polynoids are carnivores with jaws on their eversible proboscis. They feed on small crustaceans, polychaetes, echinoderms, gastropods, sponges, and hydroids. Harmothoe imbricata was found in Coyle Cove. Algal fragments are reported to be found in the gut of this scale worm but it is thought that they are consumed incidentally when encrusting animals are eaten (Appy et al., 1980; Fauchald and Jumars, 1979).

Family Sabellidae - Fanworms: Fanworms are tubiculous suspension feeders. They spread tentacles out the top of the tube to filter the surrounding water. Filtrate is sorted into three size groups and used as food, tube building material, or discarded (Appy et al., 1980; Fauchald and Jumars, 1979).

Family Scalibregmidae: These worms are burrowing deposit feeders. A sac-like eversible proboscis is used to seize sediment as in the bamboo worms. They are reported to burrow to a depth of 60 cm in soft sediments (Appy et al., 1980; Fauchald and Jumars, 1979).

Family Serpulidae - Fanworms: Serpulid fanworms are suspension feeders which build calcareous tubes. Tentacular feeding processes are expanded out the top of these tubes to filter the surrounding water (Appy et al., 1980; Barnes, 1980; Fauchald and Jumars, 1979).

Family Sigalionidae - Scale worms: Sigalionid scale worms are burrowing carnivores which seize prey with a jawed eversible proboscis. They are reported to feed on polychaetes but it is postulated that their diet will be found to be more varied in future investigations (Appy et al., 1980; Fauchald and Jumars, 1979).

Family Sphaerodoridae: These non-tubiculous worms have a muscular eversible proboscis. One species has been examined and sand grains were found in the gut. Based on this data they are postulated to be deposit feeders (Appy et al., 1980; Fauchald and Jumars, 1979). DF

Family Spionidae: Spionids are tube-dwelling surface deposit feeders. They have two long palps each having a ciliated channel for propelling food particles from the sediment surface to the mouth. It has been reported that planktonic organisms are also captured with their palps (Appy et al., 1980; Barnes, 1980; Fauchald and Jumars, 1979). DF

Family Syllidae: Syllids are small, crawling, non-tubiculous worms. There are four subfamilies, all found locally, of which three are carnivores. Carnivorous forms feed on hydroids, bryozoans, and other colonial invertebrates (Appy et al., 1980; Fauchald and Jumars, 1979). C(DF)

Family Terebellidae: Terebellids are large surface deposit-feeding worms. Most live in tubes but a few species are sedentary burrowers. Tentacles are spread over the bottom and sediment particles are transported to the mouth along ciliated grooves in these tentacles (Appy et al., 1980; Fauchald and Jumars, 1979). DF

Class Oligochaeta DF

Marine oligochaetes are burrowing deposit feeders. Movement is by peristaltic contractions as in the earthworm. They are very abundant in the littoral zone in estuarine environments but were not common in our sampling area (Barnes, 1980; Gosner, 1978).

PHYLUM ARTHROPODA

Class Pycnogonida - Sea spiders C(O)

Most sea spiders are carnivores, feeding on hydroids, corals, anemones, and bryozoans. The remaining species are omnivorous, feeding on algae, microorganisms, and sediments found on bryozoans and hydroids. Very few sea spiders were found in Coyle Cove and identifications were only to the family level. All sea spiders were therefore grouped as carnivores (Barnes, 1980; Gosner, 1978).

Class Cirripedia

Family Balanidae - Barnacles: Barnacles in this family are sessile filter feeders adapted for living on rocks or other hard substrates in exposed areas. Balanus balanoides was found in Coyle Cove. It is a selective filter feeder utilizing particles as small as 1-2 microns in diameter (Barnes, 1980; Newell, 1970).

Class Malacostraca

Order Euphausiacea:

Family Euphausiidae - Krill: Euphausids are omnivorous and chiefly planktonic as adults. They feed on crustaceans, detritus, diatoms, dinoflagellates, tintinnids, radiolarians, coccolithophores, Sagitta, algae, and Ommatidia. Planktonic food is obtained by filtering surrounding water with setae on the first six thoracic appendages. Deposit feeding is carried out by creating water currents to lift deposits into suspension where they may be filtered. Lastly, zooplankton may be preyed upon by being sucked into the mouthparts by movements of the thoracic limbs. Diet has been shown to vary substantially seasonally (Barnes, 1980; Mauchline and Fischer, 1969).

Order Decapoda:

Family Cancridae - Cancer crabs: Cancer crabs are opportunistic feeders which were grouped as functional carnivores. Cancer irroratus, the rock crab, has a diet of over 85% live animal matter, the next being made up of plants and detritus. One other species, the Jonah crab, C. borealis, was found in our samples but published feeding studies were not found (Bigford, 1979; Scarratt and Lowe, 1972).

Family Crangonidae: The sand shrimp, Crangon septemspinosa, was found in Coyle Cove. It is a benthic-dwelling carnivore feeding chiefly on mysids, amphipods, small gastropods, and pelecypods (Gosner, 1978; Squires, 1965).

Family Hippolytidae: These inshore shrimp species are omnivores. Three species were found in Coyle Cove. Eualus gaimardi feeds chiefly on phytobenthos, ostracods, crustaceans, foraminiferans and polychaetes. No feeding data were available on E. pusiolus. Lastly, Lebbeus polaris feeds mainly on phytobenthos, crustaceans, ostracods, and amphipods (Gosner, 1978; Squires, 1965).

Family Majiidae - Spider crabs: Hyas coarctatus is an omnivore. Principal food items are phytobenthos, crustaceans, foraminiferans, ophiuroids, pelecypods, crabs, sea urchins, and gastropods. Only one individual was found in the sample area (Gosner, 1978; Squires, 1965). O

Family Nephropsidae - Lobsters: Homarus americanus was found in Coyle Cove. It is a carnivore with over 75% of the diet being made up of live prey - decapods, molluscs, echinoderms and polychaetes. Moribund fish and algal detritus make up the remainder of the diet (Barnes, 1980; Carter and Steele, 1982; Scarratt, 1980). C

Family Paguridae - Hermit crabs: Hermit crabs are omnivorous scavengers. They feed on hydroids, foraminiferans, small crustaceans, and phytobenthos. Two species, Pagurus acadianus and Pagurus arctuatus, were found in the area sampled (MacGinitie and MacGinitie, 1968; Gosner, 1978). C

Family Portunidae - Crabs: The green crab, Carcinus maenas, was found in Coyle Cove. Like the cancer crabs these crabs are opportunistic feeders and have been grouped with the carnivores. The diet consists of over 85% animal prey, chiefly molluscs. Annelids, arthropods, plants, and moribund fish are also consumed (Ropes, 1968). C

Order Mysidacea:

Family Mysidae: Mysids are benthic-dwelling omnivores. Food is obtained in two methods, by filter feeding while swimming and by feeding on organic detritus. Mysis stenolepis was found in Coyle Cove (Barnes, 1980; Gosner, 1978; Tattersall and Tattersall, 1951). O

Order Cumacea:

Family Diastylidae: Cumaceans are deposit feeders living buried in mud or sand. Organic detritus is obtained by filtering and scraping sand grains. Diastylis quadrispinosa was collected at our sample area (Barnes, 1980; Gosner, 1978). DF

Order Isopoda:

Family Idoteidae: These isopods are opportunistic feeders which we grouped as functional herbivores. Idotea balthica feeds on Fucus, but occasionally eats animal remains or live animals. Edotea triloba, the other species found, is a more estuarine species and probably has a similar diet (Naylor, 1975; Rasmussen, 1973). H

Order Amphipoda:

Most amphipods are detritivores feeding by scraping sand grains, filtering suspended detritus, raking particles off the bottom, or seizing particles with the mouthparts. Many supplement their diet by catching small animals and others are true suspension feeders. Only the caprellids were identified to the family level (hyperiid amphipods were found in Coyle Cove) (Barnes, 1980; Gosner, 1978).

Family Caprellidae: Caprellids are usually carnivores feeding on crustaceans. Of the genera found in the area, two are carnivores and one omnivorous. Most of the caprellids found in Coyle Cove belong to the carnivorous genera Flegina (Caine, 1974; Laubitz, 1972).

PHYLUM BRYOZOA

Bryozoans are sessile colonial filter feeders. They feed on phytoplankton, bacteria, and sometimes zooplankton. Individual members of a colony are small, usually less than 0.5 mm (Barnes, 1980; Gosner, 1978).

PHYLUM ECHINODERMATA

Class Stelleroidea

Family Asteriidae - Starfish: Starfish are carnivores, feeding on bivalves, gastropods, crustaceans, echinoderms, polychaetes and moribund fish. Two species were found in Coyle Cove, Asterias forbesii and A. vulgaris (Barnes, 1980; Ferguson, 1969).

Family Echinasteridae - Blood stars: Blood stars are deposit feeders which trap mucus, plankton, and detritus that come into contact with the epidermis. Suspension feeding is a supplementary feeding mechanism. Food is transported to the mouth along ciliated channels. Henricia sp. were found in Coyle Cove (Barnes, 1980; Ferguson, 1969).

Family Goniopectinidae - Mud stars: Mud stars are deposit feeders which feed in the same manner as the blood stars. Ctenodiscus crispatus was found in Coyle Cove (Barnes, 1980; Gosner, 1978).

Family Ophiactidae - Brittle stars: Brittle stars are suspension feeders. Mucus-covered spines and podia catch suspended detritus and plankton. Ophiopholis aculeata was common in the area studied (Barnes, 1980; Gosner, 1978).

Class Echinodea

Family Strongylocentrotidae - Sea urchins: H
Strongylocentrotus droebachiensis, the local sea urchin, is an opportunistic feeder which was grouped as a functional herbivore. It feeds on algae, a variety of invertebrates, and detritus. Feeding studies show that feeding type depends largely on food availability, algae being preferred. Because of the availability of algae in Coyle Cove the urchin was grouped with the herbivores (Lawrence, 1975).

PHYLUM CHORDATA

Class Ascidiacea SF

Sessile tunicates are filter feeders. Several species were found in Coyle Cove, but none were identified because all are of the same feeding type (Barnes, 1980).

ACKNOWLEDGEMENTS

We gratefully acknowledge Ms. Anne MacKinnon for assistance in sorting and identification and Dr. Derek Davis of the Nova Scotia Museum for consultation on difficult identifications. We also thank Dr. Ginette Robert and Leslie Linkletter for reviewing the manuscript.

REFERENCES

Abbott, R.J. 1954. American seashells. D. Van Nostrand Company Inc., Princeton, N.J., 541 pp.

Appy, T.D., L.E. Linkletter, and M.J. Dadswell. 1980. A guide to the marine flora and fauna of the Bay of Fundy. (Annelida. Polychaeta.) Can. Fish. Mar. Serv. Tech. Rep. No. 920, 124 pp.

Barnes, R.D. 1980. Invertebrate zoology. 4th Edition, Saunders College, Philadelphia, PA., 1089 pp.

Bigford, T.E. 1979. Synopsis of biological data on the rock crab, Cancer irroratus. NOAA Tech. Rep. NMFS Circ. 426, 26 pp.

Brinkhurst, R.O., L.E. Linkletter, E.I. Lord, S.A. Connors, and M.J. Dadswell. 1975. A preliminary guide to the littoral and sublittoral marine invertebrates of Passamaquoddy Bay. (Barnes Hopkins Ltd., Saint John, N.B., 166 pp.)

Caine, E.A. 1974. Comparative functional morphology in three species of caprellids from the northwestern Florida gulf coast. J. Exp. Mar. Biol. Ecol. 15:81-96.

Carter, J.A. and D.H. Steele. 1982. Stomach contents of immature lobsters (Homarus americanus) from Placentia Bay, Newfoundland. Can. J. Zool. 60: 337-347.

Fauchald, K. and P.A. Jumars. 1979. The diet of worms: A study of polychaete feeding guilds. Oceanogr. Mar. Biol. Ann. Rev. 17: 193-284.

Fenchel, T., L.H. Kofeod, and A. Lappalainen. 1975. Particle size selection of two deposit feeders: the amphipod Corophium volutator and the prosobranch Hydrobia ulvae. Mar. Biol. 17: 119-128.

Ferguson, J.C. 1969. Food digestion and nutrition in Echinodermata. In Florkin and Scheel (Eds.) Chemical Zoology. Vol. 3, Academic Press, New York, N.Y.: 71-100.

Fretter, V. and A. Graham. 1962. British prosobranch molluscs. Ray Society, London, 755 pp.

Gardiner, M.S. 1972. The biology of invertebrates. McGraw-Hill Book Company, New York, N.Y., 954 pp.

Gosner, K.L. 1971. Guide to identification of marine and estuarine invertebrates. Wiley-Interscience. New York, N.Y., 693 pp.

---------- 1978. A field guide to the Atlantic shore. The Peterson Field Guide series N. 24. Houghton Mifflen Company, Boston, Mass., 329 pp.

Graham, A. 1955. Molluscan diets. Proc. Malacol. Soc. London, 31: 144-159.

Laubitz, D.R. 1972. The caprellids (Crustacea Amphipoda) of Atlantic and Arctic Canada. Nat. Mus. Nat. Sci., Pub. Biol. Oceangr. No. 4, 82 pp.

Lawrence, J.M. 1975. On the relationship between marine plants and sea urchins. Oceangr. Mar. Biol. Ann. Rev. 13: 213-286.

MacGinitie, G.E. and N. MacGinitie. 1968. Natural history of marine animals. McGraw-Hill Book Company, New York, N.Y., 523 pp.

Mauchline, J. and L.R. Fischer. 1969. The biology of euphausids. Adv. Mar. Biol. 7: 1-439.

Morris, P.A. 1973. A field guide to shells of the Atlantic and Gulf coasts and the West Indies. 3rd Edition. The Peterson Field Guide, Series No. 3. Houghton Mifflen Company, Boston, Mass. 330 pp.

Morten, J.E. 1967. Molluscs. Hutchinson and Co. Ltd. London, U.K., 244 pp.

Naylor, E. 1955. The diet and feeding mechanisms of Idotea. J. Mar. Biol. Ass. U.K. Vol. 34: 347-355.

Newell, R.C. 1970. Biology of intertidal animals. Logos Press Ltd. London. U.K., 555 pp.

Nicol, J.A.C. 1967. The biology of marine animals. 2nd Edition. Hazell, Watson, and Viney Ltd., Aylesbury, Buck, U.K., 699 pp.

Nicolas, W.L. 1975. The biology of free living nematodes. Claredon Press, Oxford, 219 pp.

Purchon, R.D. 1968. The biology of the Mollusca. Pergammon Press, Toronto, 560 pp.

Radwin, G.E. 1972. The family Columbellidae in the Western Atlantic. The Veliger 19(4): 403-417.

Rasmussen, E. 1973. Systematics and ecology of the Isefjord marine fauna (Denmark). Ophelia 2, 495 pp.

Ropes, J.W. 1968. Feeding habits of the green crab, Carcinus maenas. U.S. Fish. Wildl. Ser. Fish. Bull. 67(2): 183-203.

Scarratt, D.J. 1980. The food of lobsters. In Pringle, Sharp, and Caddy (Eds.) Proceedings of a workshop on the relationship between sea urchin grazing and commercial plant/animal harvesting. Can. Tech. Rep. Fish. Aquat. Sci. 954: 66-91.

Scarratt, D.J. and R. Lowe. 1972. Biology of rock crab (Cancer irroratus) in Northumberland Strait. J. Fish. Res. Board Can. 29: 161-166.

Squires, H.J. 1965. Decapod crustaceans of Newfoundland, Labrador, and the Canadian Arctic. MS Rep. 810, F.R.B. Canada, 212 pp.

Tattersall, W.M. and O.S. Tattersall. 1951. The British Mysidacea. Ray Soc., London, 460 pp.

Younge, C.M. and T.E. Thompson. 1976. Living marine molluscs. W. Collins Sons and Co. Ltd. Glasgow, U.K., 188 pp.